

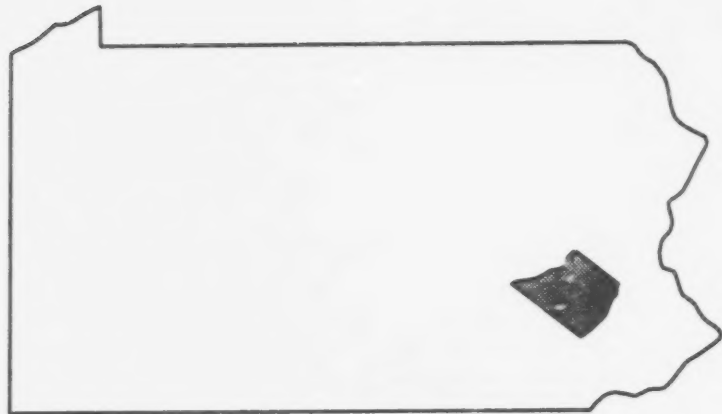
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FEM 421098

FLOOD INSURANCE STUDY



**TOWNSHIP OF
ROCKLAND,
PENNSYLVANIA
BERKS COUNTY**



SEPTEMBER 2, 1988



Federal Emergency Management Agency

COMMUNITY NUMBER - 421098

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

TABLE OF CONTENTS

	<u>Page</u>
1.0 <u>INTRODUCTION</u>	1
1.1 Purpose of Study	1
1.2 Authority and Acknowledgments	1
1.3 Coordination	1
2.0 <u>AREA STUDIED</u>	2
2.1 Scope of Study	2
2.2 Community Description	2
2.3 Principal Flood Problems	2
2.4 Flood Protection Measures	2
3.0 <u>ENGINEERING METHODS</u>	4
3.1 Hydrologic Analyses	4
3.2 Hydraulic Analyses	4
4.0 <u>FLOODPLAIN MANAGEMENT APPLICATIONS</u>	6
4.1 Floodplain Boundaries	6
4.2 Floodways	6
5.0 <u>INSURANCE APPLICATION</u>	8
6.0 <u>FLOOD INSURANCE RATE MAP</u>	9
7.0 <u>OTHER STUDIES</u>	10

TABLE OF CONTENTS - continued

	<u>Page</u>
8.0 <u>LOCATION OF DATA</u>	10
9.0 <u>BIBLIOGRAPHY AND REFERENCES</u>	10

FIGURES

Figure 1 - Vicinity Map	3
Figure 2 - Floodway Schematic	7

TABLES

Table 1 - Summary of Discharges	5
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EXHIBITS

Exhibit 1 - Flood Profiles	
Sacony Creek	Panels 01P-02P
Little Sacony Creek	Panel 03P
Bieber Creek	Panels 04P-06P
Exhibit 2 - Flood Insurance Rate Map and Street Index	
Exhibit 3 - Elevation Reference Marks	

FLOOD INSURANCE STUDY
TOWNSHIP OF ROCKLAND, BERKS COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Rockland, Berks County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 8. This work was completed in January 1987.

1.3 Coordination

On November 15, 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the township, and the USGS (the study contractor) to determine the streams to be studied by detailed methods. On September 18, 1987, a final CCO meeting was held with representatives of FEMA, the township, and the study contractor to review the results of the study.

1

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Rockland, Berks County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: Sacony Creek, from the downstream corporate limits to a point approximately 0.3 mile upstream of Sally Ann Furnace Road; Little Sacony Creek, from its confluence with Sacony Creek to a point approximately 60 feet upstream of Smoketown Road; and Bieber Creek, from a point approximately 120 feet downstream of the downstream corporate limits to a point approximately 0.6 mile upstream and from a point approximately 300 feet downstream of Princetown Road to a point approximately 0.6 mile upstream of Lyons Road. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through January 1992.

West Branch Pine Creek and the remaining portions of Sacony Creek, Little Sacony Creek, Bieber Creek, and several unnamed tributaries were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Township of Rockland.

2.2 Community Description

The Township of Rockland is located in the eastern part of Berks County in southeastern Pennsylvania, approximately 8 miles northeast of Reading. It is bordered by the Township of Maxatawny to the north, the Township of Longswamp to the northeast, the Township of District to the east, the Township of Pike to the southeast, the Township of Oley to the south, the Township of Ruscombmanor to the west, and the Township of Richmond to the northwest.

2.3 Principal Flood Problems

Major floods cause localized inundation of structures along Sacony Creek, Little Sacony Creek, Bieber Creek, and their tributaries.

2.4 Flood Protection Measures

There are no known structural flood protection measures within the Township of Rockland that would alleviate the flooding problems within the Township of Rockland.

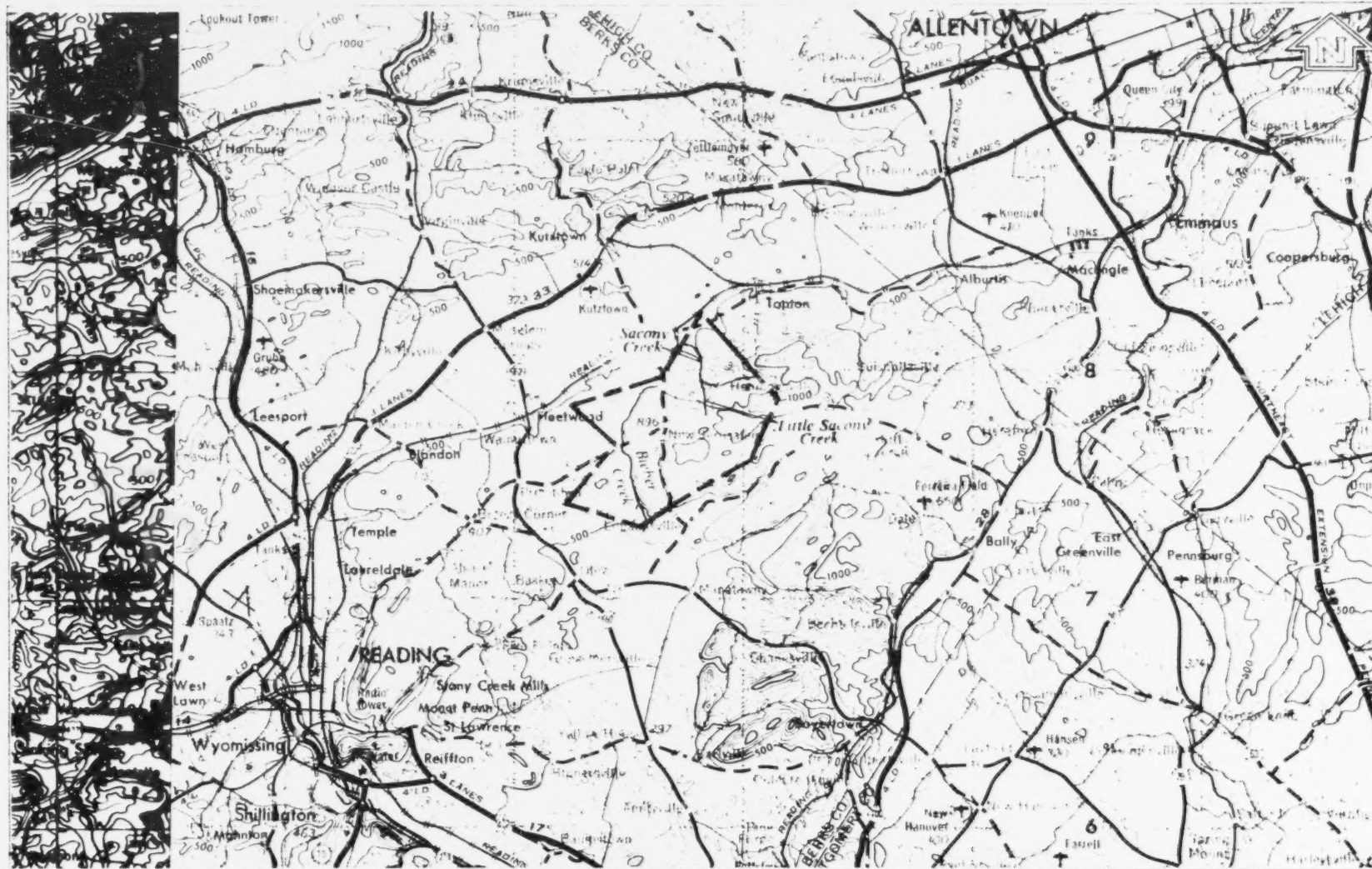


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA
(BERKS CO.)

APPROXIMATE SCALE



VICINITY MAP

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The flood frequency discharge values for Sacony Creek, Little Sacony Creek, and Bieber Creek were determined utilizing regional regression equations developed in USGS Water Resources Investigations 82-21 (Reference 1).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the streams studied by detailed methods were field surveyed and located at close intervals above and below bridges and culverts to compute the significant backwater effects of these structures. All bridges, dams, and culverts in the community were field surveyed to obtain elevation data and structural geometry.

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGE (cfs) 100-YEAR</u>
SACONY CREEK		
At lower corporate limits	5.65	1,530
Above confluence of Little Sacony Creek	3.77	1,130
LITTLE SACONY CREEK		
At confluence with Sacony Creek	1.42	560
BIEBER CREEK		
At lower corporate limits	8.24	1,960
At Pricetown Road	4.64	1,300
At Stimmel Road	1.72	640
At upper study limit	1.08	450

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

For the streams studied by detailed methods, normal depths of flooding for the 100-year recurrence interval were estimated from the regional relationship between drainage area and flood depth (Reference 2). This relationship was developed by means of regional regression analyses of basin areas and 100-year within-channel depths observed at stream gages. Depths were adjusted on the basis of hydraulic calculations to account for increased depth due to backwater from hydraulic structures, such as bridges and culverts (References 3, 4, and 5). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of engineering judgment and field inspection of the floodplain areas. For the streams studied by detailed methods, the channel "n" values ranged from 0.026 to 0.034, and the overbank "n" values ranged from 0.035 to 0.060.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study

are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 6).

For the streams studied by approximate methods, the floodplain boundaries were delineated using the Flood Hazard Boundary Map for the Township of Rockland (Reference 7).

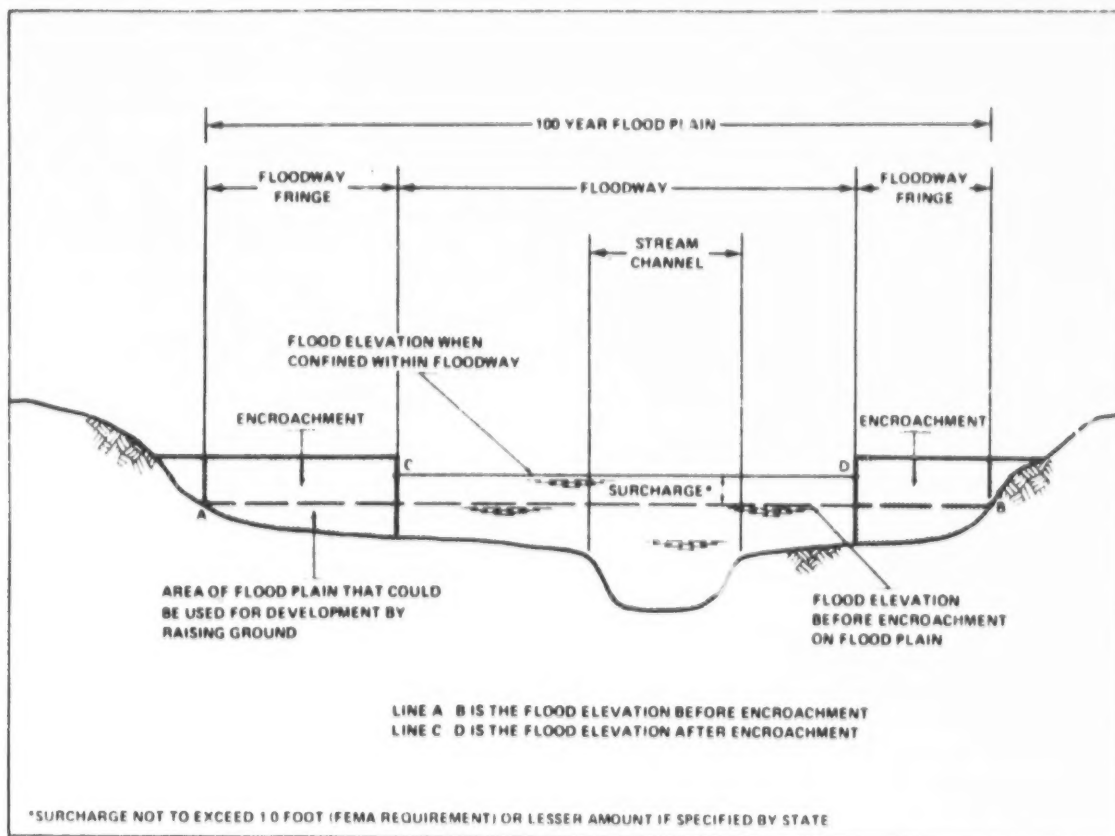
The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that

the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.



FLOODWAY SCHEMATIC

Figure 2

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

Flood Insurance Studies for the Townships of District, Pike, Richmond, and Maxatawny have been prepared (References 8, 9, 10, and 11). The results of the Pike study do not agree with the results of this study due to the more up-to-date information used in this study. The results of this study are in agreement with the results of the other studies.

Due to its more detailed nature, this study supersedes the Flood Hazard Boundary Map for the Township of Rockland (Reference 7).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

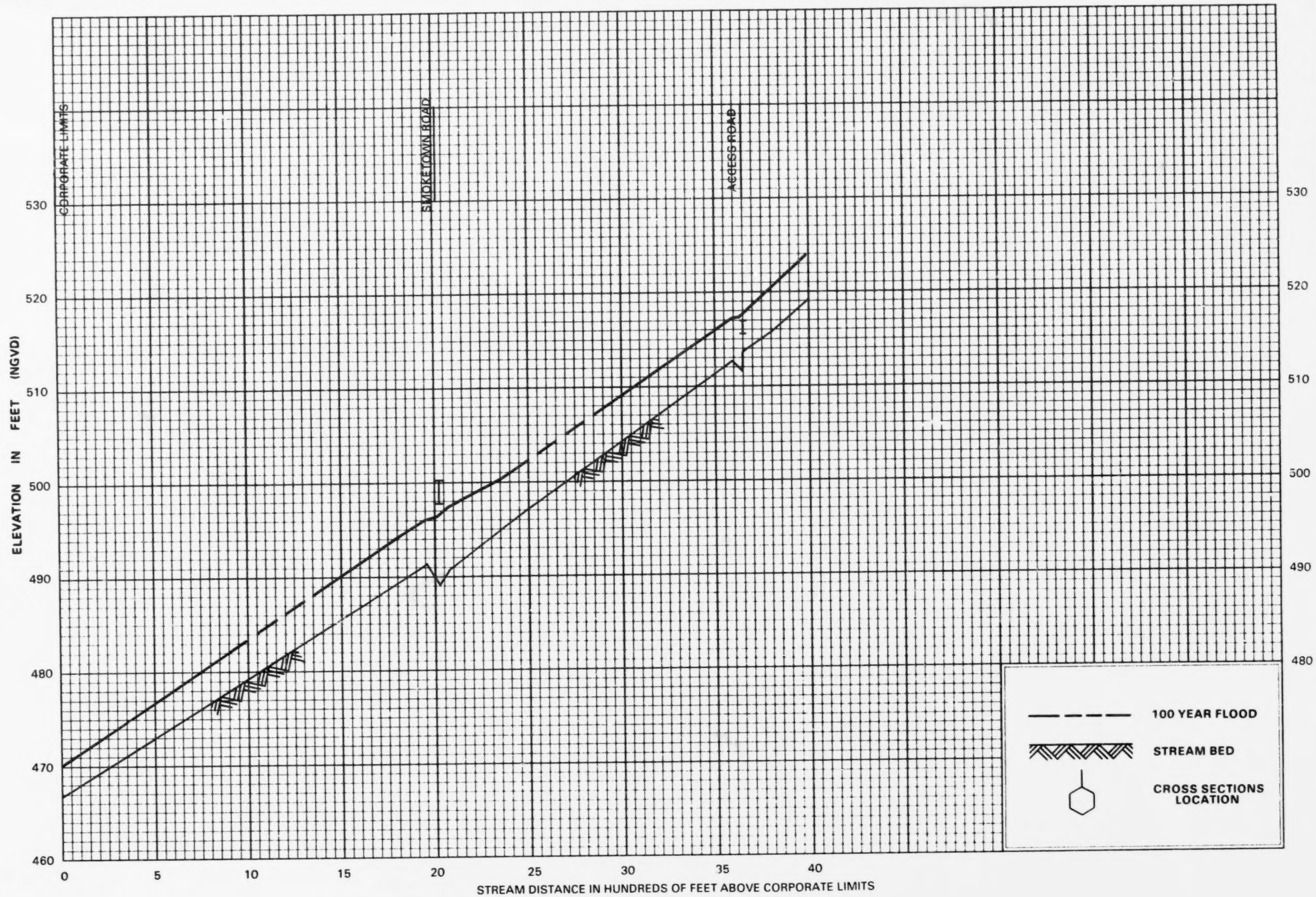
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2. U. S. Department of the Interior, Geological Survey, Water-Resources Investigations 86-4195, Technique for Estimating Depths of 100-year Floods in Pennsylvania by H. N. Flippo, Jr., Harrisburg, Pennsylvania, 1986.
3. U. S. Department of the Interior, Geological Survey, Techniques of Water-Resources Investigations, Measurement of Peak Discharge at Culverts by Indirect Methods by G. L. Bodhaine, Washington, D. C., 1968.
4. U. S. Department of the Interior, Geological Survey, Techniques of Water-Resources Investigations, Measurement of Peak Discharge at Width Contractions by Indirect Methods by H. F. Matthai, Washington, D. C., 1967.
5. U. S. Department of the Interior, Geological Survey, Techniques of Water-Resources Investigations, Measurement of Peak Discharge at Dams by Indirect Methods by Harry Hulsing, Washington, D. C., 1976.
6. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Fleetwood, Pennsylvania, 1956, Photorevised 1974; Manatawny, Pennsylvania, 1957, Photorevised 1973.

7. U. S. Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Rockland, Berks County, Pennsylvania, July 2, 1976.
8. Federal Emergency Management Agency, Flood Insurance Study, Township of District, Berks County, Pennsylvania, Washington, D. C., August 19, 1985.
9. Federal Emergency Management Agency, Flood Insurance Study, Township of Pike, Berks County, Pennsylvania, Washington, D. C., July 18, 1983.
10. Federal Emergency Management Agency, Flood Insurance Study, Township of Richmond, Berks County, Pennsylvania, Washington, D. C., September 17, 1982.
11. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Township of Maxatawny, Berks County, Pennsylvania, Washington, D. C., November 5, 1980.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

<u>Reference Mark</u>	<u>Elevation (Feet NGVD)</u>	<u>Description of Location</u>
RM 1	461.98	Pa. Dept. of Highways disk on northwest corner of Fleetwood Road bridge over Sacony Creek.
RM 2	546.75	Chiseled square on top of east upstream wing wall of Sally Ann Furnace Road bridge over Sacony Creek.
RM 3	434.08	Top of bolt in 1 foot square concrete post approximately 0.8 foot above ground on west bank of Bieber Creek approximately 20 feet upstream of bridge to Empathy Gardens retreat.
RM 4	658.64	Chiseled square on top of east downstream wing wall of Pricetown Road bridge over Bieber Creek.
RM 5	667.90	Chiseled square on east upstream wing wall of Clay Valley Road bridge over Bieber Creek.
RM 6	750.91	Standard tablet stamped 31 EOM 1946 751 in concrete post at south end of village of Dryville; 1.1 miles north of New Jerusalem; 35 feet northwest of junction of Lyons Road and Forge Dale Road.



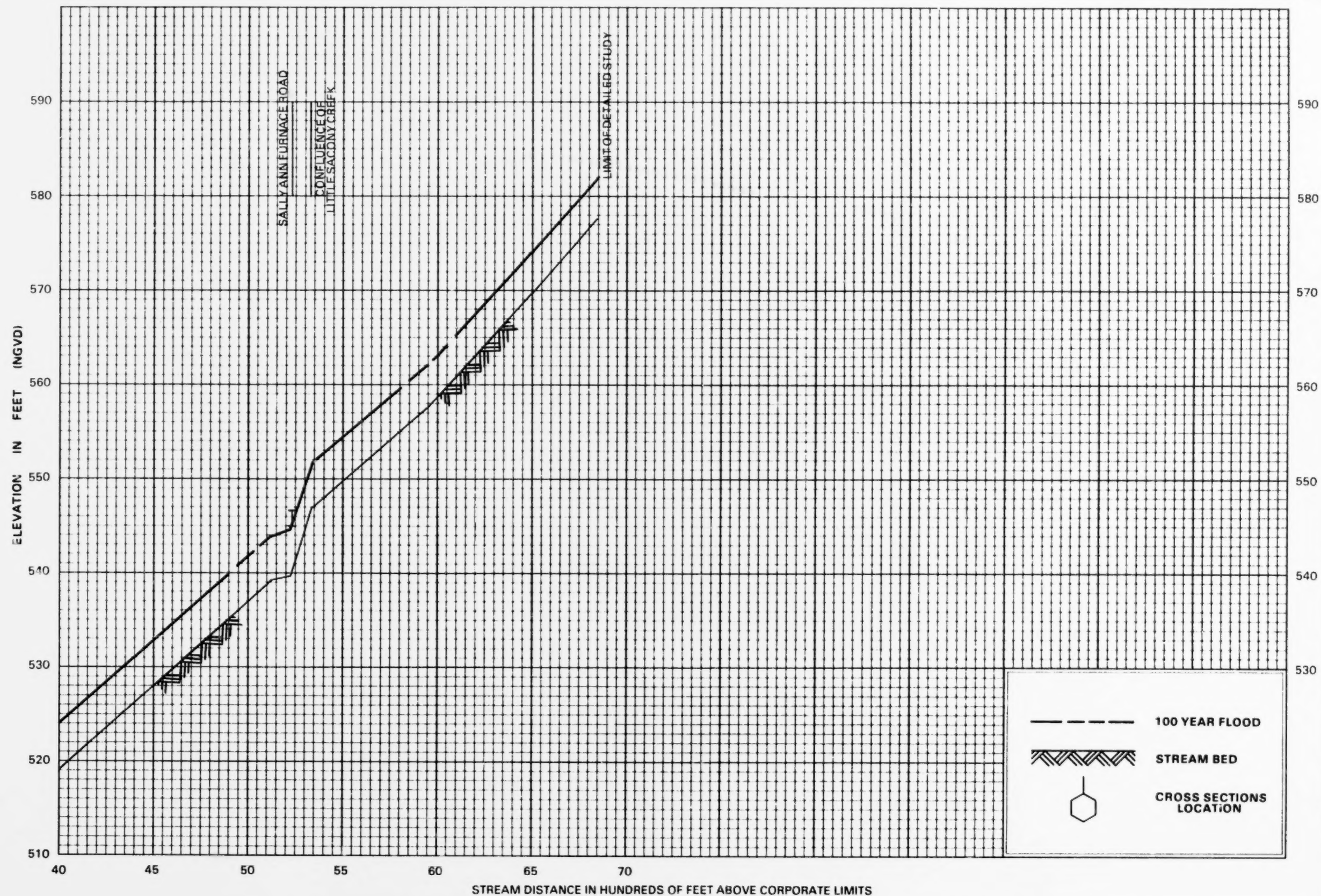
FLOOD PROFILES

SACONY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA
(BERKS CO.)

01P



FLOOD PROFILES

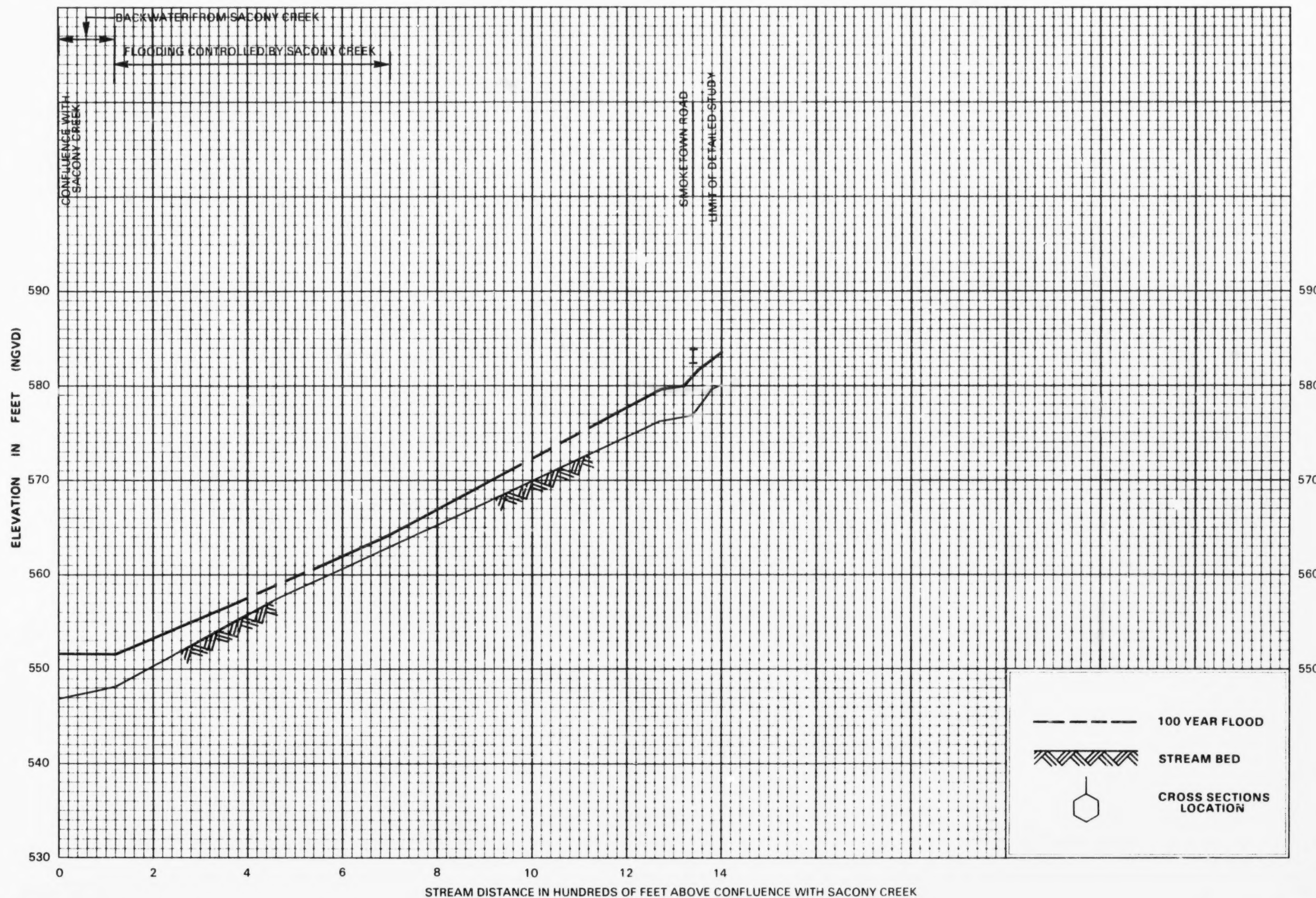
SACONY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA

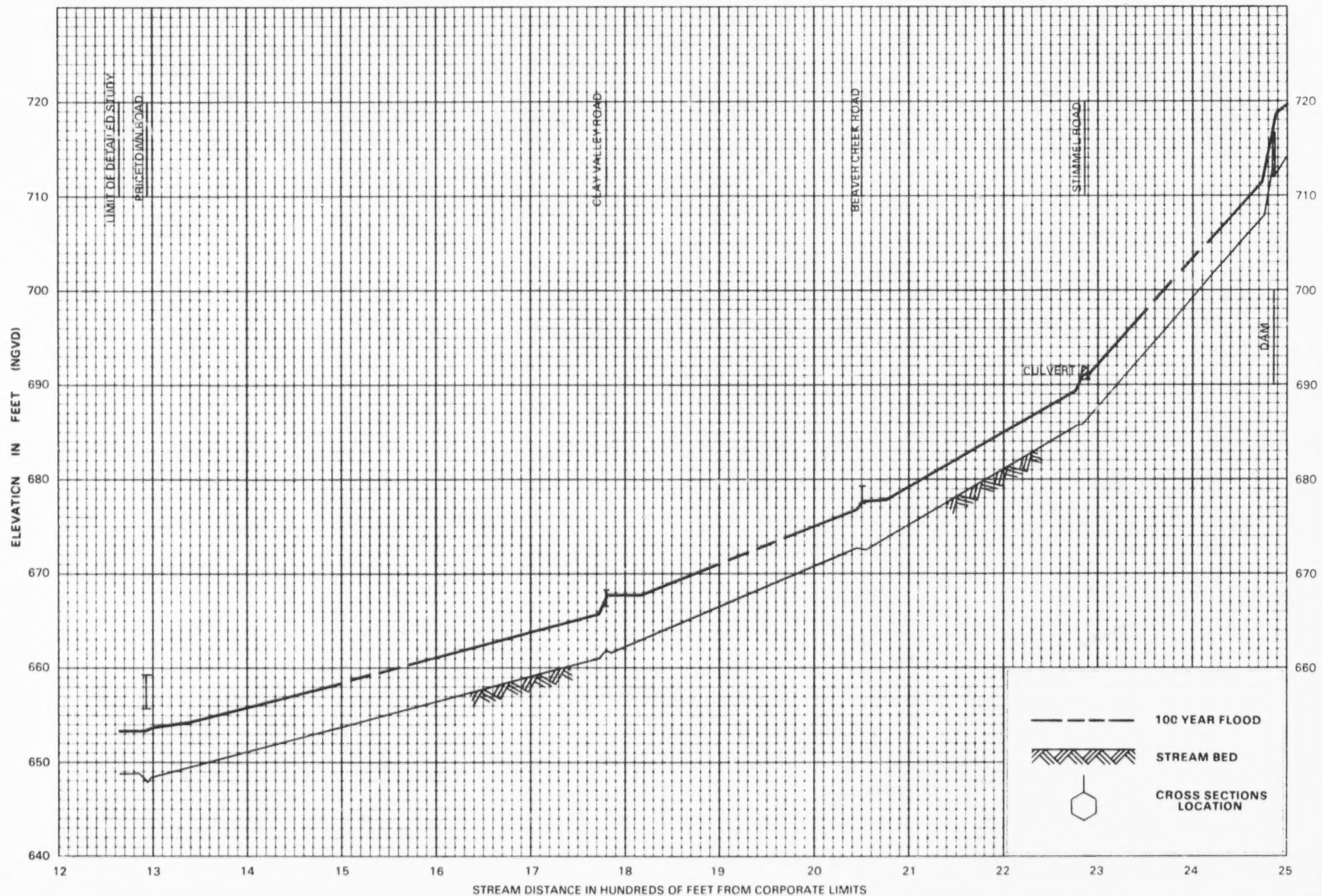
(BERKS CO.)

02P



FLOOD PROFILES
LITTLE SACONY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWNSHIP OF ROCKLAND, PA
(BERKS CO.)



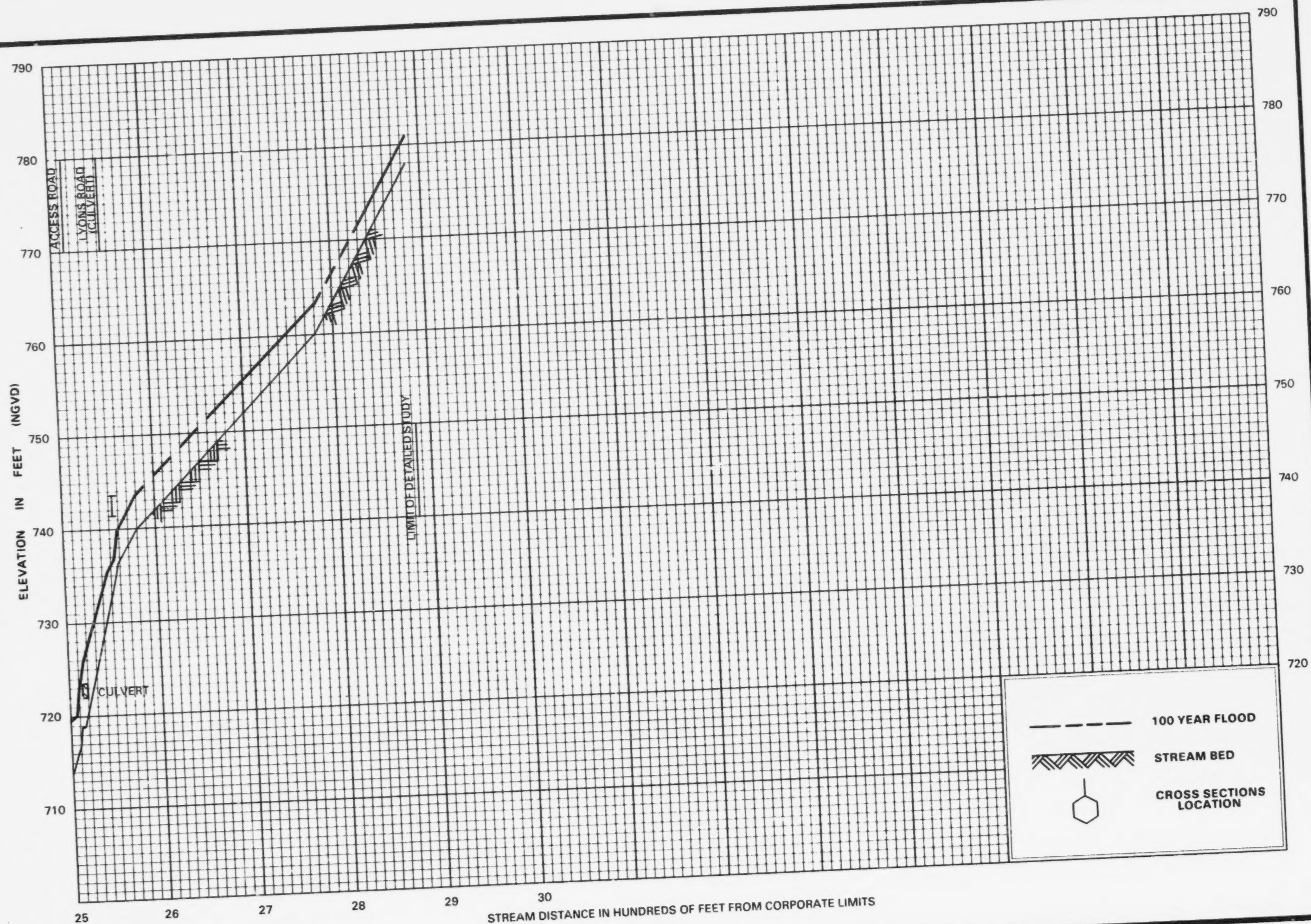
FLOOD PROFILES

BIEBER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA
(BERKS CO.)

05P



FLOOD PROFILES

BIEBER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA
(BERKS CO.)

06P